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Bibliometric analysis on sports-associated infections in athletes

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Abstract

This bibliometric study aims to provide a comprehensive analysis of the scientific literature on sports-associated infections in athletes by conducting an examination of articles indexed in the Scopus database from 2013 to 2023. A systematic search was conducted in the Scopus database using relevant keywords related to sports-associated infections and athletes. The search was limited to articles published between 2013 and 2023. Co-authorship and co-occurrence analyses were performed using VOSviewer software, version 1.6.19. A total of 540 articles were included in the analysis. The publication output on sports-associated infections in athletes demonstrated a consistent upward trend during the study period, indicating a growing interest in the field. The United States emerged as the leading country in terms of publication volume, followed by European countries such as the United Kingdom, Italy, and Germany. Notably, there was a notable absence of literature from Asian and African countries. Interestingly, COVID-19 was the most frequently studied topic in the sports-associated infections in the last several years. This bibliometric study provides a comprehensive overview of the scientific literature on sports-associated infections in athletes indexed in the Scopus database from 2013 to 2023. The findings highlight the increasing research interest in this field and the prominent contributions from countries in America and Europe. However, it also underscores the need for enhanced research efforts in Asian and African regions. The identified research gaps and collaboration opportunities can guide future research directions, ultimately contributing to the prevention, management, and overall well-being of athletes regarding sports-associated infections.

Keywords: *bibliometric analysis, sports-associated infections, athletes, publication trends, COVID-19*

Introduction

Sport has been widely recognized for its positive impact on overall health (Rohmansyah, Ka Praja, Phanpheng, & Hiruntrakul, 2023). However, sports-related infections are a significant concern for athletes, as they can lead to detrimental health effects, performance decline, and potential transmission to others (Ahmadinejad, Alijani, Mansori, & Ziaee, 2014). The field of sports medicine has increasingly recognized the impact of infectious diseases on athlete health and performance. Sports activities, characterized by close physical contact, shared equipment, and communal spaces, create an environment conducive to the transmission of pathogens (Braun & Kahanov, 2018). In recent years, numerous studies have been conducted to investigate various aspects of sports-associated infections, including etiology, risk factors, prevention strategies, and management approaches (Chesson et al., 2021; Friman & Wesslén, 2000; Ruuskanen, Luoto, Valtonen, Heinonen, & Waris, 2022). However, there remains a need to assess the overall research landscape and identify key research areas that require further attention.

Bibliometric analysis provides a quantitative evaluation of research output, enabling a comprehensive overview of the scientific literature. It allows the identification of influential publications, leading authors, contributing institutions, and collaborative networks within a specific research field (Donthu, Kumar, Mukher-

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jee, Pandey, & Lim, 2021; Glynatsi & Knight, 2021). Such analyses can provide valuable insights into the growth of research in a particular area, highlight geographical and institutional contributions, and identify potential research gaps and emerging trends (Mejia, Wu, Zhang, & Kajikawa, 2021; Sweileh, 2020).

To our knowledge, no comprehensive bibliometric study has been conducted specifically focusing on sports-associated infections in athletes. By conducting a systematic analysis of the Scopus database, we aim to fill this knowledge gap and provide a comprehensive overview of the scientific literature published on this topic from 2013 to 2023. The Scopus database is widely recognized as a reliable and inclusive source of scientific publications, encompassing a broad range of journals and disciplines (Pham-Duc, Tran, Huu Hoang, & Bao Do, 2022).

Understanding the landscape of research on sports-associated infections is crucial for identifying research trends, knowledge gaps, and areas requiring further exploration. This study will enable us to identify the publication trends, prominent authors and institutions, collaborative networks, and citation patterns within the field of sports-associated infections in athletes. The findings will not only contribute to the existing body of knowledge but also guide future research directions and facilitate evidence-based decision-making in the prevention and management of sports-related infections. In this study, we aim to conduct a comprehensive bibliometric analysis of the scientific literature on sports-associated infections in athletes by examining articles indexed in the Scopus database from 2013 to 2023.

Methods

Data collection

A systematic search was conducted by 2 researchers independently, R.K.P., and N.A.R., in the Scopus database using relevant keywords related to sports-associated infections and athletes ("Infection in sport" or "Infection in athlete" or "Infectious disease in sport" or "Infectious disease in athlete"). The search was limited to articles published between 2013 and 2023, ensuring a comprehensive coverage of the literature on the topic. The inclusion criteria for this bibliometric analysis were original articles written in English. The exclusion criteria were (i) non original articles such as conference papers, editorials, letters, commentaries, and book chapters and (ii) studies not specifically related to sports-associated infections in athletes, such as general infection research or studies focusing on non-athletic populations. Through the systematic search, a total of 540 articles were identified. Data were extracted by R.K.P. from the Scopus database, including publication titles, authors, affiliations, keywords, publication year, and citation information.

Data preprocessing

The collected data were imported into VOSviewer version 1.6.19, a widely used bibliometric software (Li et al., 2023; Liu, Zhu, Wu, Lu, & Yu, 2022; Sweileh, 2020; van Eck & Waltman, 2010). Data preprocessing was performed to clean the dataset, remove duplicates, and standardize author names and affiliations.

Co-occurrence analysis

Co-occurrence analysis was conducted to identify frequently co-occurring terms in the field of sports-associated infections. Relevant keywords or terms related to sports-associated infections were extracted from the dataset. VOSviewer version 1.6.19 was employed to visualize co-occurrence networks, where terms were represented as nodes and co-occurrence relationships were depicted as links (van Eck & Waltman, 2010). The size of the nodes represented the frequency of term occurrence, while the thickness of the links indicated the strength of co-occurrence between terms.

Co-authorship analysis

Co-authorship networks were created to visualize collaborations among authors in the field of sports-associated infections. VOSviewer version 1.6.19 was used to generate co-authorship maps, where authors were represented as nodes and co-authorship relationships were represented as links (van Eck & Waltman, 2010). The size of the nodes indicated the productivity or number of publications by each author, while the thickness of the links represented the strength of collaboration between authors.

Data visualization and analysis

The co-authorship and co-occurrence maps generated by VOSviewer 1.6.19 were further analyzed and interpreted. Key clusters of collaboration among authors and significant co-occurring terms were identified. In addition, the most frequently studied key themes were also identified.

Ethical Considerations

The study adhered to the principles of responsible research conduct and confidentiality by only utilizing aggregated data without identifying individual authors or institutions.

Results

Trend in publication output

A total of 540 articles were included in the bibliometric analysis. The analysis of publication output over the period from 2013 to 2023 revealed a significant increase in the number of publica-

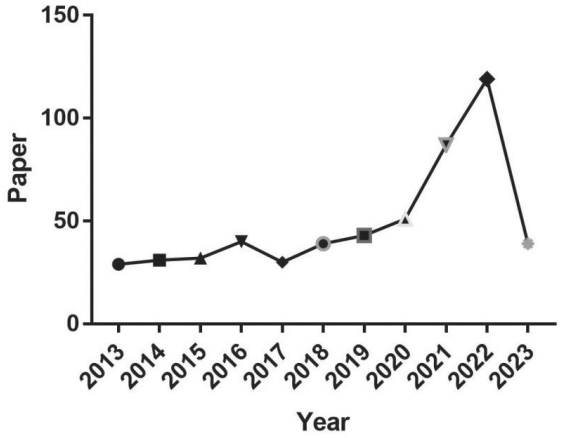

FIGURE 1. Research trend in sports-associated infections from 2013 to 2023.

tions related to sports-associated infections in athletes. Figure 1 presents the trend in publication output over time.

The findings demonstrate a steady growth in the number of publications on sports-associated infections. The initial years (2013-2017) witnessed a relatively modest number of publications, but there was a noticeable upward trend starting from 2018. The growth continued to accelerate, reaching its peak in 2022. This upward trajectory signifies the increasing attention and research focus on sports-associated infections and their implications for athlete health.

Co-occurrence analysis findings

The co-occurrence analysis provided insights into the main research themes and key concepts in the field of sports-associated infections. Figure 2 presents the co-occurrence network of terms, highlighting the most frequently co-occurring terms in the literature.

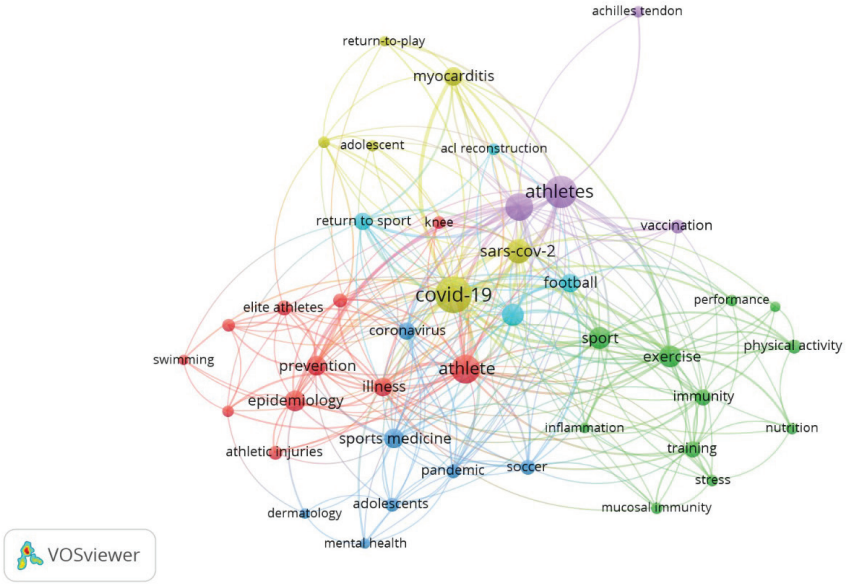

FIGURE 2. Network visualization result of co-occurrence analysis of sports-associated infections in the Scopus database (2013-2023).

The analysis revealed several prominent terms that frequently co-occurred in the literature. These included "covid-19," "athletes," "epidemiology," "prevention," and "myocarditis." The strong co-occurrence links between these terms indicated their interconnectedness and relevance within the research domain. These findings highlight the emphasis on understanding the prevention, epidemiology, and management of covid-19 infections in the context of sports and athletes.

Furthermore, specific subthemes emerged from the co-occurrence analysis, such as "vaccination," "football," and "return to sport." These subthemes represent important areas of research focus for addressing sports-associated infections and ensuring the well-being of athletes especially for football.

The analysis of publication output specifically related to COVID-19 infection within the broader field of sports-associated infections revealed a significant increase in the number of publications. Figure 3 presents the trend in publication output on COVID-19 infection over time.

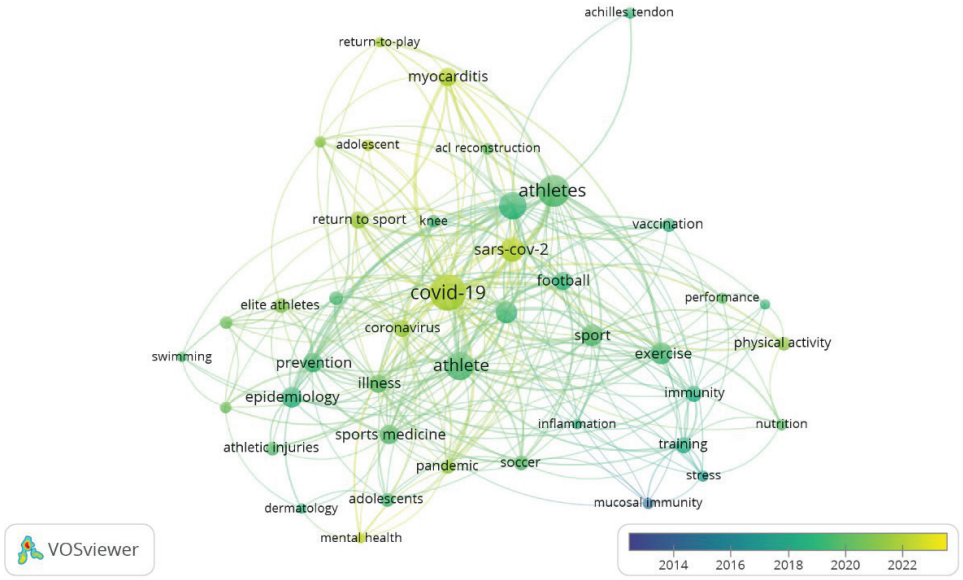

FIGURE 3. Overlay visualization result of co-occurrence analysis of sports-associated infections in the Scopus database (2013-2023).

The findings demonstrate a notable surge in the number of publications on COVID-19 infection in athletes starting from the year 2020. The COVID-19 pandemic had a profound impact on sports and athlete health, leading to increased research focus on understanding the implications of the virus in sports settings. The publication output related to COVID-19 infection continued to rise steadily, highlighting the urgency and relevance of this topic.

Co-authorship analysis findings

The co-authorship analysis revealed collaboration patterns among countries in the field of sports-associated infections in athletes. The co-authorship network demonstrated the collaborative relationships between countries based on their joint publications. Figure 4 illustrates the co-authorship network by country, highlighting the countries with the highest collaboration.

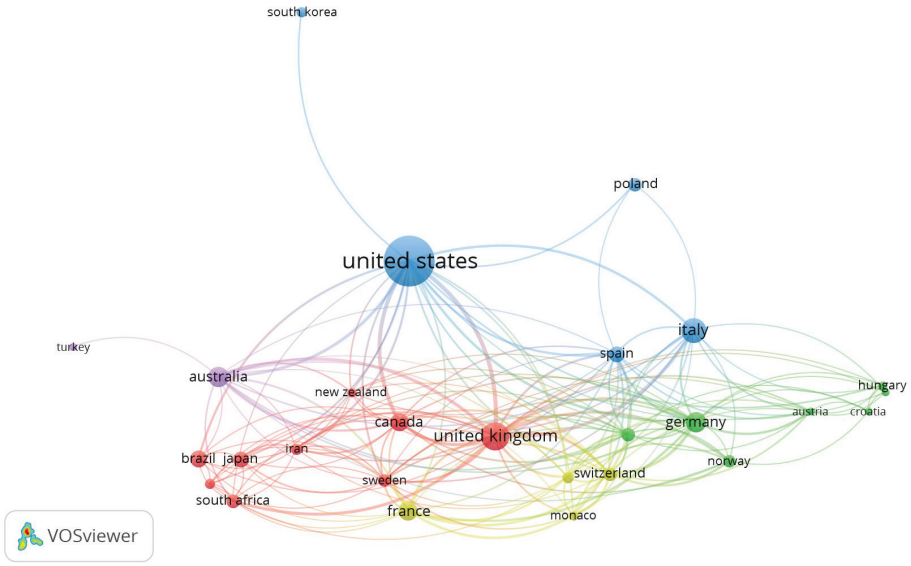

FIGURE 4. Co-authorship network by country conducting research on of sports-associated infections in the Scopus database (2013-2023).

The analysis identified several prominent countries that actively contributed to the literature on sports-associated infections. The top collaborating countries included the United States, the United Kingdom, Italy, Germany and Australia. These countries exhibited a high degree of collaboration, as evidenced by the strong links between their nodes in the co-authorship network. Their collaborative efforts have significantly contributed to advancing knowledge in the field.

The analysis of publication output on sports-associated infections in athletes from 2013 to 2023 revealed the top ten active countries in terms of the number of publications in the field. Table 1 presents the top ten countries and their corresponding publication counts.

Table 1. Top ten active countries publishing papers on sports-associated infections in the Scopus database (2013-2023).

No.	Country	Document	Citations	Total link strength
1	United States	199	2644	83
2	United Kingdom	61	1704	94
3	Italy	49	515	39
4	Germany	33	287	49
5	Australia	31	801	43
6	France	28	802	40
7	Canada	26	905	51
8	Brazil	23	308	13
9	Spain	21	355	39
10	Japan	20	100	14

The results highlight the countries that have made significant contributions to the literature on sports-associated infections. The United States emerged as the leading country, with a substantial number of publications, followed by the United Kingdom, Italy, Germany, and Australia. These countries demonstrated a strong research focus on sports-associated infections and have actively contributed to advancing knowledge in the field.

Other notable countries in the top ten list included France, Canada, Brazil, Spain, and Japan. Their contributions through research publications have enriched the understanding of sports-associated infections and have provided valuable insights for the implication of sports-associated infections. Additionally, these findings underscore the global attention given to sports-associated infections and the collaborative efforts of researchers from various countries to address this important health issue in athletes.

Discussion

Sports-associated infections pose a significant health concern for athletes and understanding the research landscape in this area is crucial for guiding future studies and interventions. This biblio-

metric study aimed to analyze the publication trends and contributions in the field of sports-associated infections in athletes using the Scopus database from 2013 to 2023. The findings provide valuable insights into the research landscape, highlight research gaps, and identify areas for further investigation.

The analysis revealed a notable increase in the number of publications related to sports-associated infections over the study period. This trend indicates the growing recognition of the importance of athlete health and the need for evidence-based approaches to prevent, diagnose, and treat infections in sports settings. The surge in publications related to COVID-19 infection in athletes during the years 2020 to 2023 further reflects the profound impact of the pandemic on the sports community and the urgent need to address the unique challenges posed by the virus (Breidenbach & Mitze, 2021; Hughes, Orchard, Partridge, La Gerche, & Broderick, 2022).

The results also shed light on the top active countries in terms of publication output in the field. The United States, the United Kingdom, Italy, Germany, and Australia emerged as the leading contributors, highlighting their research productivity and commitment to advancing knowledge in sports-associated infections. These countries have established research networks, funding opportunities, and academic resources that facilitate research collaboration and knowledge exchange, enabling them to lead in this field. It is worth noting that the presence of several European countries in the top ten active countries indicates the strong research focus on sports-associated infections in Europe.

While the findings demonstrate the overall growth in research on sports-associated infections, it is important to acknowledge certain limitations. First, the analysis relied on the Scopus database, and while it provides a comprehensive collection of scholarly literature, it may not capture all relevant publications in the field. Second, the study focused on bibliometric analysis, which primarily examines publication output and does not assess the quality or impact of the included studies. Future research could incorporate other metrics, such as citation analysis and expert opinion, to gain a more comprehensive understanding of the field.

The results of this bibliometric study provide a foundation for further research on sports-associated infections in athletes. The identified research gaps and areas with limited publication output highlight opportunities for future investigations. For instance, there is a need for more studies focusing on specific types of infections, preventive strategies, athlete demographics, and long-term health outcomes. Additionally, collaborative efforts among researchers, institutions, and sports organizations could foster interdisciplinary research and knowledge translation, leading to effective interventions and guidelines for athlete health and well-being.

Conclusion

In conclusion, this bibliometric study on sports-associated infections in athletes highlights the growing interest and research activity in the field. The findings underscore the importance of continued research efforts to better understand, prevent, and manage infections in sports settings. By addressing research gaps and fostering collaboration, the scientific community can contribute to improving the health and performance of athletes worldwide.

Conflict of Interest

The author declares that there is no conflict of interest.

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